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Fluxes of heat and volume at the 5° S vent sites on the MAR

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The data presented here have been collected during SPP 1144 cruises M68/1 in May 2006 and L'Atalante in January 2007. The data set comprises CTD temperature, salinity, pressure and turbidity profiles and tow-yos, direct velocity measurements with a Lowered acoustic Doppler current profiler (LADCP), water and fluid samples for Helium analysis and moored current meter records.

The fluxes and transports of the 5° S hydrothermal fields Turtle Pits, Comfortless Cove and Red Lion are to a large extent determined by the location of the sites in relation to the surrounding rift valley. The vents are situated in the centre of the valley at a topographic sill, where the height of the side walls of the valley exceeds the plume rise height.

The flow field and its tidal modulation is determined from lowered ADCP and moored current meters. The volume flux is additionally estimated from the along-valley hydrography: The difference in the stratification between upstream conditions (south of the sill) and downstream conditions (north of the sill) indicates a northward transport below the density bifurcation depth at 2600 m. This volume transport can be estimated as $\approx 0.3 \times 10^6$ m^3/s by using a simple model which depends on the width of the sill, the stratification, and the bifurcation depth.

The water column plumes of the vent fields are clearly identifiable by a strong signal in turbidity and a negative temperature anomaly compared to the surrounding water; along-axis and cross axis tow-yos section show distinct plumes located downstream of the Turtle Pits and Red Lion sites. Both plumes show a maximum rise height of 235

m. Together with the ambient stratification, this rise height of the plume can be used to calculate the heat flux of the respective smoker. The heat flux estimates lie in the range between 10 MW for the Red Lion and 20 MW for the Turtle Pits plume.

The combination of the flow field with the Helium concentrations yield an estimates of the Helium flux; the ^{3}He concentration at the fluid exit together with the vent temperature allows an independent estimate of the heat flux from the individual smokers.